



BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES
IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : Basceri et al.
Serial No. : 09/904,112
Filed : July 11, 2001
Title : CAPACITOR WITH HIGH DIELECTRIC CONSTANT MATERIALS
Docket : MIO 0057 PA/40509.93 (98-1070)
Examiner : J. Kennedy
Art Unit : 2812

CERTIFICATE OF MAILING

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Susan M. Luna
Susan M. Luna Reg. No. 38,769

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Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

REPLY BRIEF ON APPEAL

This Reply Brief is being filed pursuant to the provisions of 37 CFR 41.41(a)(1) in response to the Examiner's Answer mailed November 18, 2004. Arguments responsive to the issues raised in the Answer are set forth below. Pursuant to §41.43(a)(1), the Examiner is requested to acknowledge receipt and enter the reply brief.

Related Appeals and Interferences

A related appeal has been filed in divisional application Serial No. 10/170,987 filed June 11, 2002. An appeal brief was filed in that application on November 12, 2003.

Status of Claims

Appellants note the Examiner's indication that claims 11-12 have been allowed, and that claims 47-49 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form. Accordingly, the rejected claims remaining for consideration by the Board on appeal are claims 1-6, 8-10, 15, 22-30, 37-46, 50, 57-63, 74-76, and 100-105.

Rejection of claims 1-6, 15, 22-30, 37-42, 45-46, 74-76, and 100-105 under 35 U.S.C. 102(e) as being anticipated by Kunitomo et al. (U.S. Patent No. 6,235,572)

At page 7 of the Answer, the Examiner asserts that Appellants have not provided any evidence in support of their argument that Kunitomo et al. do not teach or suggest the claimed method. The Examiner states that "arguments of counsel cannot take the place of evidence in the record," citing *In re Geisler*, 116 F.3d 1465, 43 USPQ2d 1362 (Fed.Cir.1997). However, that case relates to an obviousness rejection, not a rejection based on anticipation. Appellants are not obligated to provide extrinsic evidence in support of their arguments; rather, it is the Examiner's burden to provide factual evidence or reasoning which establishes that Kunitomo et al. disclose each and every limitation in appellants' claims. Appellants submit that the Examiner has not satisfied this burden.

The Examiner has pointed to no specific teaching in Kunitomo et al. which discloses that a conductive oxide electrode and a first layer of high dielectric constant oxide dielectric material are oxidized such that at least the surface of the conductive oxide electrode is provided with enough oxygen to provide stability with the first layer of high dielectric constant oxide dielectric material as claimed. Rather, the Examiner has reasoned that Kunitomo's teaching of crystallizing the tantalum oxide layer in an oxidation atmosphere will "necessarily" oxidize the lower electrode. However, the Examiner has provided no factual evidence to support her conclusion.

The Examiner asserts at page 9 of the Answer that Appellants admitted at page 7 of their Appeal Brief that the lower electrodes in Kunitomo et al. are oxidized when performing the crystallization process of the tantalum oxide. However, appellants pointed out that this occurs only if one **chooses** ruthenium oxide as the conductive oxide electrode. The Examiner continues to ignore that the need for **choosing** ruthenium oxide as the conductive oxide electrode negates anticipation. There is no clear teaching in Kunitomo et al. of using ruthenium oxide as the conductive oxide electrode, nor is there any clear

teaching in Kunitomo et al. which teaches a method oxidizing the ruthenium oxide and tantalum oxide film in a manner which results in the surface of the conductive oxide electrode having enough oxygen to provide stability with the tantalum oxide film. In order for there to be anticipation, there must be some explicit teaching in Kunitomo to oxidize in the claimed manner such that all of the recited steps in appellants' claims are described. Here, there is none.

While the Examiner has reasoned that Kunitomo teaches one of appellants' claimed method steps because they disclose that the lower electrode may be oxidized during crystallization of the tantalum oxide film ("...it follows that the conductive oxide is provided with enough oxygen so as to be stable with the oxide dielectric layer"), this teaching in Kunitomo requires one to choose ruthenium oxide as the lower electrode, and further refers to a different heat treatment than that claimed, i.e., at a temperature of 650°C or more.

With regard to claims 2, 4, and 42, which recite the use of a gas plasma for oxidation at a temperature of about 250°C to about 500°C, the Examiner has taken the position that Kunitomo et al. teach a gas plasma treatment at a temperature range which overlaps with the claimed ranges, referring to col. 2, lines 18-21, and column 19, lines 10-15. However, as previously pointed out, the only lower temperatures disclosed by Kunitomo et al., i.e., 600°C or less, are taught where the crystallization of the tantalum oxide film is carried out **separately** from oxidation processing and the lower electrode is not oxidized. See col. 19, lines 8-25.

With regard to claim 28, the Examiner asserts that appellants have not provided support for their argument that Kunitomo et al. do not teach or suggest oxidizing their second film layer 58. The Examiner is referred to Appellant's Brief at page 8, third paragraph, where it is pointed out that Kunitomo et al. teach that, where a ruthenium oxide film is formed on the lower electrodes, further oxidation is restricted to avoid stress for the crystallized tantalum oxide films 56 and 58. While the Examiner asserts that deposition of the second tantalum oxide film is achieved in the same manner as the first tantalum oxide film, i.e., crystallization,

there is no teaching or suggestion in Kunitomo et al. of oxidizing and crystallizing the second tantalum oxide film in the manner claimed by appellants.

With regard to claims 40 and 45, in response to appellants' argument that one skilled in the art would have to pick and choose from among Kunitomo's disclosed tungsten, titanium nitride, and ruthenium materials, which negates anticipation, the Examiner maintains that species/genus logic is applicable in this case "since the issue at hand is indeed a composition." Appellants strongly disagree. As previously pointed out, even if one picks and chooses from the materials disclosed in Kunitomo et al. to meet one step in the claimed process, that does not equate to anticipating the entire claim which recites multiple steps.

There is no clear teaching in Kunitomo et al. of a method of forming a capacitor which includes all six steps recited in claim 40: 1) providing a conductive oxide electrode selected from the group consisting of RuO_x and IrO_x , 2) depositing a first layer of a dielectric material selected from the group consisting of Ta_2O_5 and $\text{Ba}_x\text{Sr}_{(1-x)}\text{TiO}_3$ on the conductive oxide electrode, 3) oxidizing the conductive oxide electrode and first layer of dielectric material with a gas plasma such that at least the surface area of the conductive oxide electrode is provided with enough oxygen to provide stability with the first layer of dielectric material, 4) depositing a second layer of said dielectric material on the first layer of the dielectric material, 5) depositing an upper layer electrode on the said second layer of said dielectric material, and 6) oxidizing the upper layer electrode. As required by MPEP §2131, in order to establish anticipation, the Examiner must demonstrate that the single prior art reference describes each and every element recited in as complete detail as recited, and arranged as recited in the claims.

Rejection of claims 8-10, 43-44, 50, and 57-61 under 35 U.S.C. 103(a) as being unpatentable over Kunitomo et al. in view of Joo (U.S. Patent No. 5,879,957)

While appellants pointed out in their brief that Joo does not teach oxidation of an upper layer electrode as claimed, the Examiner has reasoned that

because Joo discloses forming a ruthenium oxide layer on a ruthenium layer by a thermal or plasma oxidation method, "the ruthenium layer is disclosed as being oxidized." Even if this is the case, Appellants again wish to point out that the ruthenium oxide layer 36 formed in Joo comprises the **lower** electrode of the capacitor, not an **upper** layer electrode as claimed. Joo teaches that platinum layer 41 functions as the upper electrode of the capacitor, and there is no teaching of oxidizing the upper electrode of Joo.

The Examiner asserts that "it does not matter that Joo is not oxidizing to form an upper layer electrode, Joo is relied upon for the method of oxidizing ruthenium to form ruthenium oxide." The Examiner further reasons that one skilled in the art would have been motivated to form the upper electrode of Kunitomo et al. "by the method of oxidizing ruthenium as disclosed by Joo et al." Appellants disagree. While the Examiner asserts that one would have been motivated to oxidize the upper electrode of Kunitomo et al. by a gas plasma technique "in order to avoid a heat treatment at a high temperature," Joo does not even teach or suggest a temperature range for plasma oxidation. The Examiner then reasons that since plasma methods "are commonly done at lower temperatures than thermal oxidation methods one of ordinary skill in the art would perform a plasma method rather than a thermal method." Again, the Examiner has provided no factual basis or evidence to support her conclusion. The Examiner cannot establish a case of obviousness by simply stating that the basis for combining the references comes from common knowledge. See *In re Lee*, 277 F.3d 1338, 1343, 61 USPQ2d 1430, 1433 (Fed. Cir. 2002).

There is clearly no teaching or suggestion in Joo or Kunitomo et al. which would lead one skilled in the art to choose a plasma oxidation method for oxidation of an **upper** layer electrode as claimed. Claims 8-10, 43-44, 50, and 57-61 are clearly patentable over combined teachings of Kunitomo et al. and Joo.

Rejection of claims 62-63 under 35 U.S.C. 103(a) as being unpatentable over
Kunitomo et al. and Joo in view of Kingon et al. (U.S. Patent No. 5,555,486)

At page 18 of the Answer, the Examiner disagreed with appellants' argument that Kingon et al. do not teach a method of forming a gas permeable (Pt) electrode on an upper electrode prior to oxidizing the upper layer electrode as recited in claims 62-63. However, the Examiner has not addressed appellants' argument that Kingon et al. do not teach forming a gas permeable electrode **on** an upper electrode as claimed. While Kingon et al. teach an upper electrode which comprises a hybrid electrode structure such as Pt/RuO₂, this is not the same as or equivalent to the formation of a gas permeable electrode **on** an upper electrode as claimed. Nor is there any teaching or suggestion in either Kunitomo or Kingon which would motivate one skilled in the art to form a gas permeable electrode on an upper electrode as claimed.

Conclusion

Appellants submit that the prior art references clearly do not anticipate the claims on appeal. Appellants further submit that the Examiner has failed to carry her burden of establishing a *prima facie* case for obviousness and that the references of record fail to teach or suggest the subject matter of the claims.

Respectfully submitted,

DINSMORE & SHOHL LLP

By Susan M. Luna
Susan M. Luna
Registration No. 38,769

One Dayton Centre
One South Main Street, Suite 1300
Dayton, Ohio 45402-2023
(937) 449-6429
Facsimile: (937) 449-6405
SML/